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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/494,211	01/25/2000	Il-Ki Woo	003364.P035	3154

7590 10/24/2003

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EXAMINER

DOVE, TRACY MAE

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 10/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/494,211

Applicant(s)

WOO ET AL.

Examiner

Tracy Dove

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5,7,15,19,20,22,26,27 and 29-31 is/are rejected.
- 7) ☒ Claim(s) 6,8-14,16-18,21,23-25 and 28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_ 6) ☐ Other: \_\_\_\_\_

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### **DETAILED ACTION**

This Office Action is in response to the communication filed on 8/18/03. Applicant's arguments have been considered, but are moot in view of the new grounds of rejection. Claims 1-31 are pending.

#### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/18/03 has been entered.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-5, 19, 20, 29 and 30 are rejected under 35 U.S.C. 102(a) as being anticipated by Junichi et al., JP 11-339811 (note a machine translation of the Japanese document is attached).

Junichi teaches a lithium secondary battery having a negative electrode, a separator, a positive electrode and an electrolyte (abstract, 0018). The positive electrode includes a lithium cobalt oxide coated aluminum foil current collector. The separator is inserted between the positive and negative electrodes. The electrolyte includes an organic carbonate solvent and a

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LiBF<sub>4</sub> electrolyte salt. The negative electrode comprises a carbon based material coated on a negative current collector. The negative current collector is made of a copper alloy having an alloy composition of 95 wt% or more of copper and 0.01-5 wt% of at least one element selected from the group consisting of iron, nickel, chromium, phosphorus, tin and zinc. The thickness of the copper alloy foil current collector is preferably 8-25 μm (abstract). The copper alloy foil may be produced by a cold rolling process or an electrolytic decomposition process (electroplating) (0010).

Regarding claims 2, 4, 5, 19 and 20, Table 1 teaches a copper alloy foil current collector (thickness of 10 μm) having 0.3 wt% of chromium, 0.25 wt% of tin and 0.2 wt% of zinc.

Thus the claims are anticipated.

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Claim 26 is rejected under 35 U.S.C. 102(b) as being anticipated by Hideki, JP 06-333569 (note a machine translation has been obtained for the Japanese document).

Hideki teaches a nonaqueous lithium secondary battery comprising a negative electrode, a positive electrode, a separator and an electrolyte. The positive electrode includes a LiCoO<sub>2</sub> active material applied to an aluminum foil current collector (0028). The negative electrode includes a negative electrode active material applied to a current collector. The negative electrode active material may include a compound of a baked carbon material (0018). The negative electrode current collector may comprise copper (Cu), nickel (Ni), titanium (Ti) or alloys thereof. Zinc, nickel, tin and aluminum are metals that are desirably alloyed with copper. Furthermore, Fe, P, Pb, Mn, Ti, Cr, Si and/or As may be added in small quantities to the copper alloy. The negative collector has a thickness of 5-200 μm (0005-0006). The separator was

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placed between the positive and negative electrodes and the electrolyte was poured into the cell (0029). The Table on page 7 of the translation lists specific alloy compositions for the negative electrode current collector (0032-0033). Example No. 28 discloses a copper (Cu)/chromium (Cr)/zirconium (Zr) negative electrode current collector having a composition ratio of (98.8/1/0.2) and a thickness of 19  $\mu\text{m}$ . Example No. 27 discloses a Cu/Ni/Ti (80/18/2) negative electrode current collector. Example No. 25 discloses a Cu/Ni/Fe/Mn negative electrode current collector having a thickness of 15  $\mu\text{m}$ . The current collector preferably has a foil shape (0010).

Thus the claim is anticipated.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 5, 7, 15, 29 and 31 are rejected under 35 U.S.C. 102(b)/35 U.S.C. 103(a) as being anticipated by, and alternatively unpatentable over, Hideki, JP 06-333569 (note a machine translation has been obtained for the Japanese document).

Hideki teaches a nonaqueous lithium secondary battery comprising a negative electrode, a positive electrode, a separator and an electrolyte. The positive electrode includes a  $\text{LiCoO}_2$  active material applied to an aluminum foil current collector (0028). The negative electrode includes a negative electrode active material applied to a current collector. The negative electrode active material may include a compound of a baked carbon material (0018). The negative electrode current collector may comprise copper (Cu), nickel (Ni), titanium (Ti) or

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alloys thereof. Zinc, nickel, tin and aluminum are metals that are desirably alloyed with copper. Furthermore, Fe, P, Pb, Mn, Ti, Cr, Si and/or As may be added in small quantities to the copper alloy. The negative collector has a thickness of 5-200  $\mu\text{m}$  (0005-0006). The separator was placed between the positive and negative electrodes and the electrolyte was poured into the cell (0029). The Table on page 7 of the translation lists specific alloy compositions for the negative electrode current collector (0032-0033). Example No. 28 discloses a copper (Cu)/chromium (Cr)/zirconium (Zr) negative electrode current collector having a composition ratio of (98.8/1/0.2) and a thickness of 19  $\mu\text{m}$ . Example No. 27 discloses a Cu/Ni/Ti (80/18/2) negative electrode current collector. The current collector preferably has a foil shape (0010).

Regarding claims 5 and 31, Example No. 25 discloses a Cu/Ni/Fe/Mn negative electrode current collector having a thickness of 15  $\mu\text{m}$ .

Thus the claims are anticipated.

The claims are alternatively unpatentable. Hideki does not explicitly state that the copper alloy foil current collector is produced by a plating process (reference silent regarding method of producing collector). However, the courts have ruled that product-by-process limitations, in the absence of unexpected results, are obvious. See MPEP 2113. Note the instant specification teaches that "Cu-based alloy foil is generally produced by an electro-plating process or a cold-rolling process" (page 3, lines 18-19).

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Claims 3, 19, 20, 22 and 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hideki, JP 06-333569 in view of Junichi et al., JP 11-339811.

Hideki teaches a nonaqueous lithium secondary battery comprising a negative electrode, a positive electrode, a separator and an electrolyte. The positive electrode includes a  $\text{LiCoO}_2$  active material applied to an aluminum foil current collector (0028). The negative electrode includes a negative electrode active material applied to a current collector. The negative electrode active material may include a compound of a baked carbon material (0018). The negative electrode current collector may comprise copper (Cu), nickel (Ni), titanium (Ti) or alloys thereof. Zinc, nickel, tin and aluminum are metals that are desirably alloyed with copper. Furthermore, Fe, P, Pb, Mn, Ti, Cr, Si and/or As may be added in small quantities to the copper alloy. The negative collector has a thickness of 5-200  $\mu\text{m}$  (0005-0006). The separator was placed between the positive and negative electrodes and the electrolyte was poured into the cell (0029). The Table on page 7 of the translation lists specific alloy compositions for the negative electrode current collector (0032-0033). Example No. 27 discloses a Cu/Ni/Ti (80/18/2) negative electrode current collector. The current collector preferably has a foil shape (0010).

Hideki is silent regarding the process used to produce the copper-based negative electrode current collector.

However, Junichi teaches a lithium secondary battery having a negative electrode current collector made of a copper alloy. The thickness of the copper alloy foil current collector is preferably 8-25  $\mu\text{m}$  (abstract). The copper alloy foil may be produced by a cold rolling process or an electrolytic decomposition process (electroplating) (0010).

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have known that the copper-based alloy negative electrode current collector of Hideki could have been produced by a

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cold rolling process or an electrolytic decomposition process as taught by Junichi. One of skill in the art would have found it obvious to produce the copper based alloy foil current collector using a known, conventional process such as electrolytic decomposition (electroplating).

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Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hideki, JP 06-333569 (note a machine translation has been obtained for the Japanese document).

Hideki teaches a nonaqueous lithium secondary battery comprising a negative electrode, a positive electrode, a separator and an electrolyte. The positive electrode includes a  $\text{LiCoO}_2$  active material applied to an aluminum foil current collector (0028). The negative electrode includes a negative electrode active material applied to a current collector. The negative electrode active material may include a compound of a baked carbon material (0018). The negative electrode current collector may comprise copper (Cu), nickel (Ni), titanium (Ti) or alloys thereof. Zinc, nickel, tin and aluminum are metals that are desirably alloyed with copper. Furthermore, Fe, P, Pb, Mn, Ti, Cr, Si and/or As may be added in small quantities to the copper alloy. The negative collector has a thickness of 5-200  $\mu\text{m}$  (0005-0006). The separator was placed between the positive and negative electrodes and the electrolyte was poured into the cell (0029). The Table on page 7 of the translation lists specific alloy compositions for the negative electrode current collector (0032-0033). Example No. 27 discloses a Cu/Ni/Ti (80/18/2) negative electrode current collector. Example No. 25 discloses a Cu/Ni/Fe/Mn negative electrode current collector having a thickness of 15  $\mu\text{m}$ . The current collector preferably has a foil shape (0010).



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Hideki does not explicitly teach a specific example wherein the copper alloy includes copper alloyed with at least three other metals as listed in claim 26.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Hideki teaches *zinc*, *nickel*, tin and aluminum are metals that are desirably alloyed with copper. Furthermore, Fe, P, Pb, *Mn*, *Ti*, Cr, Si and/or As may be added in small quantities to the copper alloy (0005-0006). Hideki has a specific teachings of a Cu/Ni/Fe/Mn negative electrode current collector (Example 25). One of skill in the art would have been motivated to use titanium instead of iron in the Cu/Ni/Fe/Mn alloy because both titanium and iron improve the corrosion resistance of the current collector (0006-0007). Hideki teaches that Fe or Ti may be added to a copper alloy in a small amount.

***Allowable Subject Matter***

Claims 6, 21 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the claims are directed toward a lithium secondary battery having a negative electrode comprising a current collector of a copper based alloy foil. The copper based alloy comprising copper alloyed with at least four other metals wherein the least four other metals are selected from the group consisting of nickel, titanium, magnesium, tin, zinc, boron, chromium, manganese, silicon, cobalt, iron, vanadium, aluminum, zirconium, niobium, phosphorous, bismuth, lead, silver and misch metal. The prior art teaches numerous copper based alloys used for negative electrode

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current collector foils (see Hideki and Junichi). However, neither Hideki nor Junichi teaches at least four of the metals of the instant claims are alloyed with copper.

Claims 8-10, 12-14, 16-18 and 23-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the claims are directed toward a lithium secondary battery having a negative electrode comprising a current collector of a copper based alloy foil. The copper based alloy comprises copper alloyed with at least three other metals wherein at least one of the three other metals is magnesium. The prior art teaches numerous copper based alloys used for negative electrode current collector foils (see Hideki and Junichi). However, neither Hideki nor Junichi teaches magnesium as a possible metal that may be alloyed with copper.

Claim 11 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the claims are directed toward a lithium secondary battery having a negative electrode comprising a current collector of a copper based alloy foil. The copper based alloy comprises copper alloyed with at least 0.8-4 wt% of nickel and 0.2-4 wt% of titanium. The prior art teaches numerous copper based alloys used for negative electrode current collector foils (see Hideki and Junichi). However, Junichi does not teach titanium as a possible metal alloyed with copper. Hideki teaches a Cu/Ni/Ti (80/18/2) negative electrode current collector, but the amount of nickel does

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not anticipate or render obvious the claimed nickel range of 0.8-4 wt%. The Hideki reference does not teach or suggest a copper alloy comprising copper, at least 0.8-4 wt% of nickel and 0.2-4 wt% of titanium.

***Response to Arguments***

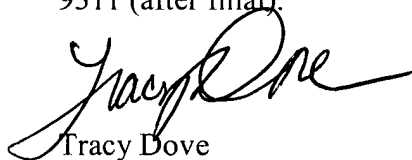
Applicant's arguments with respect to claims 1-31 have been considered but are moot in view of the new ground(s) of rejection.

Note the indication of allowable subject matter regarding claims 7, 15, 22, 26, 27 and 31 has been withdrawn. The claims have been rejected in view of newly applied prior art.

The declaration under 37 CFR 1.132 filed 6/27/03 is insufficient to overcome the rejection of claims 1-31 based upon Junichi and/or Hideki as set forth in this Office action because: the declaration does not provide evidence of unexpected results over the prior art of record.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is (703) 308-8821. The Examiner may normally be reached Monday-Thursday (9:00 AM-7:30 PM). My supervisor is Pat Ryan, who can be reached at (703) 308-2383. The Art Unit receptionist can be reached at (703) 308-0661 and the official fax numbers are 703-872-9310 (after non-final) and 703-872-9311 (after final).



Tracy Dove  
Patent Examiner  
Art Unit 1745  
October 14, 2003